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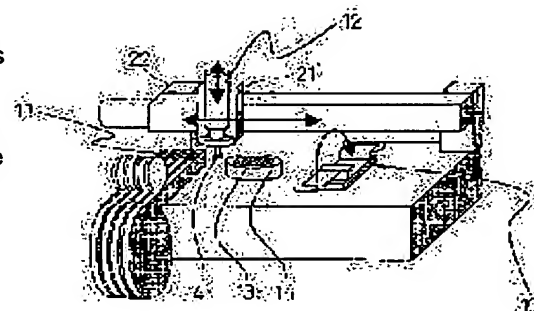
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(54) COMPOSITE ELECTRONIC PART MANUFACTURING METHOD AND DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a method and a device for manufacturing a composite electronic part by fixing a plurality of electronic parts into an integral structure.

SOLUTION: A chip resistor unit (electronic part) 4 is picked up by a suction nozzle 12 from a part feeder 11 and transferred onto an assembly stage 10, and a required number of the chip resistor units 4 are stacked up. A thermosetting adhesive agent is transferred onto the stacked chip resistor unit 4 by an adhesive agent transfer unit 14. The chip resistor units 4 stacked up on the assembly stage 10 are pressed and heated from above and sideways, so that a required number of the chip resistor units 4 are formed and fixed into a composite electronic part.



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CLAIMS

[Claim(s)]

[Claim 1] The manufacture approach of the compound electronic parts characterized by accumulating the electronic parts of a required number on said assembly section by repeating the actuation which holds the electronic parts supplied from a components feed zone with a components maintenance means, and is carried to the assembly section about the electronic parts of a required number, operating orthopedically while pasting up between the electronic parts of a required number in the assembly section, and manufacturing compound electronic parts.

[Claim 2] The adhesion between the electronic parts of a required number is the manufacture approach of the compound electronic parts according to claim 1 by the adhesives imprinted by the underside of electronic parts on the way from a components feed zone to the assembly section.

[Claim 3] The adhesion between the electronic parts of a required number is the manufacture approach of the compound electronic parts according to claim 1 by the adhesives applied to the top face of the electronic parts put on the assembly section.

[Claim 4] The manufacture approach of the compound electronic parts according to claim 1 orthopedically pressurized and operated from the top face and side face of accumulated electronic parts.

[Claim 5] The manufacture approach of compound electronic parts given in claim 1 which arranges thermosetting adhesive between the electronic parts of a required number, and is heated and stiffened at the time of plastic surgery - 4 any 1 terms.

[Claim 6] The manufacture approach of compound electronic parts given in claim 1 which operates orthopedically while accumulating the electronic parts of a required number on two or more trains and pasting the assembly section simultaneously - 5 any 1 terms.

[Claim 7] A components supply means to supply electronic parts to a supply location, and a components maintenance means to hold electronic parts, A transfer means to move this components maintenance means between a supply location and an assembly location, to transfer electronic parts to an assembly location from a supply location, and to accumulate the electronic parts of a required number on an assembly location, The manufacturing installation of the compound electronic parts characterized by coming to have an assembly means to pressurize from the top face and side face of electronic parts of an adhesives spreading means to apply adhesives to electronic parts, and the required number accumulated on the assembly location, to paste up and operate orthopedically, and to unify the electronic parts of a required number.

[Claim 8] An adhesives spreading means is the manufacturing installation of the compound electronic parts according to claim 7 which imprint adhesives on the underside of the electronic parts on the way of being transferred to an assembly location from a supply location.

[Claim 9] An adhesives spreading means is the manufacturing installation of the compound electronic parts according to claim 7 which apply adhesives to the top face of the electronic parts transferred to the assembly location.

[Claim 10] An assembly means is the manufacturing installation of compound electronic parts given in claim 7 which comes to have a heating means to heat at the time of plastic surgery and to stiffen thermosetting adhesive - 9 any 1 terms.

[Claim 11] An assembly means is the manufacturing installation of the compound electronic parts according to claim 7 which while pressurizes the side face of the accumulated electronic parts from opposite, and an elastic body is prepared in an application-of-pressure side, and become.

[Claim 12] An assembly means is the manufacturing installation of compound electronic parts given in claims 7 and 10, and 11 any 1 terms which come to have the application-of-pressure side of the width of face which pressurizes an assembly location simultaneously to the electronic parts of the required number

accumulated on two or more times.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the manufacture approach of the compound electronic parts which fix two or more electronic parts and are unified, and its equipment.

[0002]

[Description of the Prior Art] Since two or more electronic parts can be treated as one compound electronic parts when mounted in the circuit board if two or more electronic parts, such as a resistor and a capacitor, are unified and it forms in compound electronic parts, while the mounting mark to the circuit board are reducible, mounting tooth spaces are reducible. Moreover, it is effective also in making the functional part of constituting in the compound electronic parts which unify a capacitor and a coil and have the function of a filter.

[0003] Drawing 9 shows the manufacture approach of the conventional compound electronic parts, and shows the example which unifies the chip resistor of plurality (here three pieces), and manufactures compound electronic parts. As are shown in drawing 9 (a), and keep spacing, three chip resistors 4 are arranged in on the plate side 5, a pressure sensitive adhesive sheet 6 is arranged between chip resistors 4 and it is shown in push and drawing 9 (b) from both sides, three chip resistors 4 are formed in the compound electronic parts 30 which fixed with the pressure sensitive adhesive sheet 6.

[0004] As a means to fix two or more chip resistors 4 to one, the manufacture approach which applies the adhesives other than the above-mentioned pressure sensitive adhesive sheet 6 to the side face of a chip resistor 4, the manufacture approach which sticks the sheet which applied the binder on the top face of two or more chip resistors 4 which were made to stick and were put in order are adopted.

[0005]

[Problem(s) to be Solved by the Invention] However, electronic parts, such as a chip, have a remarkable miniaturization, there is a 1.0x0.5x0.35mm thing with a chip resistor actually, and the miniaturization is advancing further. When forming compound electronic parts using such minimum electronic parts, in order to have arranged the equipment for sticking equipment and a pressure sensitive adhesive sheet for adhesives applying on the assembly location, interference with the equipment for assembly was not avoided, but formation of small compound electronic parts was difficult. Moreover, by the manufacture approach which sticks the sheet which applied the binder, there was a trouble that it became difficult to secure an inter-electrode insulation.

[0006] Moreover, it is laid on a plate side so that a flat-surface part large [of a rectangular parallelepiped] may be located up and down, as shown in drawing 9 from the goodness of the stability when adsorption maintenance being carried out in respect of [which can take a large adsorption area in small electronic parts although adsorption maintenance of the electronic parts is carried out by the adsorption nozzle in order to carry electronic parts to an assembly location] being large, and laying in a plate side. Therefore, when formed in compound electronic parts, as shown in drawing 9 (b), the area of a component side (base) becomes large. Although a component-side product can be made small if the narrow flat-surface part of electronic parts forms in compound electronic parts as it is located up and down as shown in drawing 10, it is bad, and the stability when laying each electronic parts in a plate side is stabilized, and cannot put two or more electronic parts in order.

[0007] The target place has this invention in offering the manufacture approach which a component-side product unifies so that it may become small, and forms two or more small electronic parts in compound electronic parts, and its equipment.

[0008]

[Means for Solving the Problem] The manufacture approach of the compound electronic parts concerning the 1st invention of this application for attaining the above-mentioned object is characterized by to accumulate the electronic parts of a required number on said assembly section by repeating the actuation which holds the electronic parts supplied from a components feed zone with a components maintenance means, and is carried to the assembly section about the electronic parts of a required number, to operate orthopedically, while pasting up between the electronic parts of a required number in the assembly section, and to manufacture compound electronic parts.

[0009] If the condition of having been stabilized when put in the large flat-surface part of electronic parts is acquired and this is orthopedically pasted up and operated when according to the above-mentioned manufacture approach transferring electronic parts to the assembly section from a components feed zone with a components maintenance means and accumulating two or more electronic parts on the assembly section, it can form in the small compound electronic parts of a component-side product by making the narrow flat-surface part of electronic parts into a component side.

[0010] In the above-mentioned manufacture approach, the adhesion between the electronic parts of a required number is realizable on the way from a components feed zone to the assembly section by the approach of imprinting adhesives on the underside of electronic parts, or the approach of applying adhesives to the top face of the electronic parts placed by the assembly section.

[0011] Moreover, by pressurizing and operating orthopedically from the top face and side face of accumulated electronic parts, the thickness of an adhesives layer is prepared uniformly, an adhesion condition can be stabilized, a location gap etc. can be prepared, and a predetermined dimension can be made.

[0012] Moreover, thermosetting adhesive will be arranged between the electronic parts of a required number, and if it is made to heat and harden at the time of plastic surgery, plastic surgery and coincidence can be made to complete adhesion, and in ordinary temperature, in order not to harden thermosetting adhesive, in the phase imprinted or applied, it will not change but will become easy [the maintenance as adhesives].

[0013] Moreover, while accumulating the electronic parts of a required number on two or more trains and pasting the assembly section simultaneously, it can operate orthopedically, and two or more compound electronic parts can be completed simultaneously.

[0014] Moreover, the manufacturing installation of the compound electronic parts concerning the 2nd invention of this application A components supply means to supply electronic parts to a supply location, and a components maintenance means to hold electronic parts, A transfer means to move this components maintenance means between a supply location and an assembly location, to transfer electronic parts to an assembly location from a supply location, and to accumulate the electronic parts of a required number on an assembly location, It is characterized by coming to have an assembly means to pressurize from the top face and side face of electronic parts of an adhesives spreading means to apply adhesives to electronic parts, and the required number accumulated on the assembly location, to paste up and operate orthopedically, and to unify the electronic parts of a required number.

[0015] According to the above-mentioned manufacturing installation, a components maintenance means is moved between a supply location and an assembly location with a transfer means, electronic parts are transferred to the assembly section from a components feed zone, and two or more electronic parts are accumulated on the assembly section. In small electronic parts, if adsorption maintenance needs to be carried out, it will be put upon a components maintenance means in the large flat-surface part of electronic parts in respect of being large and this is pasted up and operated orthopedically, it can form in the small compound electronic parts of a component-side product by making the narrow flat-surface part of electronic parts into a component side.

[0016] An adhesives spreading means can make the pile side of required electronic parts apply adhesives selectively in the above-mentioned manufacturing installation by the configuration which imprints adhesives on the underside of the electronic parts on the way of being transferred to an assembly location from a supply location, or the configuration which applies adhesives to the top face of the electronic parts transferred to the assembly location.

[0017] Moreover, by having and constituting a heating means to heat at the time of plastic surgery and to stiffen thermosetting adhesive, at the time of plastic surgery, an assembly means can harden adhesives and can manufacture compound electronic parts efficiently.

[0018] Moreover, an assembly means can absorb dispersion in the dimension of electronic parts with an elastic body by while pressurizing the side face of the accumulated electronic parts from opposite, and

preparing and constituting an elastic body in an application-of-pressure side and a component side can be orthopedically operated so that it may become a flat surface.

[0019] Moreover, an assembly means can equip with and constitute the application-of-pressure side of the width of face which pressurizes an assembly location simultaneously to the electronic parts of the required number accumulated on two or more trains, can operate two or more compound electronic parts orthopedically simultaneously, and can be made to complete it.

[0020]

[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained with reference to an accompanying drawing, and an understanding of this invention is presented. In addition, the operation gestalt shown below is an example which materialized this invention, and does not limit the technical range of this invention.

[0021] This operation gestalt is what shows the example which fixes two or more chip resistors to one, and is manufactured to compound electronic parts. As shown in drawing 1 R> 1 The chip resistor (electronic parts) 4 supplied from a parts feeder (components supply means) 11 by the adsorption nozzle (components maintenance means) 12 The chip resistor 4 of a required number is accumulated on said assembly stage 10 by repeating the actuation which is held and is carried to the assembly stage (assembly means) 10 about the chip resistor 4 of a required number. While pasting up between the chip resistors 4 of a required number on the assembly stage 10, it operates orthopedically, and compound electronic parts are manufactured.

[0022] Said adsorption nozzle 12 is carried in the rise-and-fall driving gear 21, and carries out free migration of this rise-and-fall driving gear 21 in the direction of a graphic display arrow head with 1 shaft robot 22. Therefore, from a supply location with said parts feeder 11, the adsorption nozzle 12 can carry out free migration of between assembly locations with said assembly stage 10, and rise-and-fall actuation can be carried out free by the meantime. Moreover, a parts feeder 11 lets out the tape which contained the chip resistor 4 to a supply location, and supplies a chip resistor 4 to a supply location in detail. Moreover, as shown in drawing 2, the assembly stage 10 is equipped with fixed side side application-of-pressure section 15a, movable side side application-of-pressure section 15b, the top-face application-of-pressure section 16, and a heater 17, and forms in compound electronic parts two or more chip resistors 4 accumulated on stage 10a. Moreover, the adhesives imprint section 14 is arranged in the way which the adsorption nozzle 12 moves to the assembly stage 10 from a parts feeder 11.

[0023] The manufacture procedure of the compound electronic parts by the manufacturing installation which becomes the above-mentioned configuration is explained with reference to drawing 1 - drawing 3.

[0024] In drawing 3 (a), a parts feeder 11 holds a chip resistor 4 in the crevice 24 established in the tape 23 at equal intervals, and lets out this tape 23 to a supply location at intervals of formation of a crevice 24. The tape 23 is wound around the reel for every forms, such as resistance, and as shown in drawing 1, two or more tapes 23 are arranged in a supply location at juxtaposition. Move the adsorption nozzle 12 to a supply location with 1 shaft robot 22, it is made to descend with the rise-and-fall driving gear 21, and the adsorption maintenance of the chip resistor 4 is made to carry out at the head of a nozzle. Raise the adsorption nozzle 12, it is made to move onto the assembly stage 10, and the chip resistor 4 of the lowest location accumulated on stage 10a is laid by making it descend. By switching the vacuum negative pressure of the adsorption nozzle 12 to exhaust air, and going up, the adsorption nozzle 12 which is separated from a chip resistor 4 moves to a supply location again, and carries out adsorption maintenance of the following chip resistor 4.

[0025] Since three chip resistors 4 are fixed to one and it forms in compound electronic parts in this operation gestalt By the adsorption nozzle 12 which carried out adsorption maintenance moving the chip resistor 4 which becomes the 2nd step to accumulate from a supply location, making it stop on the adhesives imprint section 14, and making it descend As shown in drawing 3 (b), the base of a chip resistor 4 adheres to the adhesives 13 supplied on the adhesives imprint section 14, and adhesives 13 are imprinted by the base. In addition, thermosetting adhesive is used as adhesives 13 here. The chip resistor 4 with which adhesives 13 were imprinted by this base is laid on the 1st step of chip resistor 4 which is on the assembly stage 10 by migration of the adsorption nozzle 12, and becomes two steps of piles. Then, as adhesives 13 are imprinted similarly, and the 3rd step of chip resistor 4 is also carried to an assembly location and is shown in drawing 3 (c), three chip resistors 4 are changed into the condition of having put upon three steps.

[0026] As shown in drawing 3 (d), movable side side application-of-pressure section 15b will move to the fixed side side application-of-pressure section 15a side, and the assembly stage 10 will put three accumulated chip resistors 4 in the both-sides side application-of-pressure sections 15a and 15b, and if three chip resistors 4 are accumulated on stage 10a, it will operate them orthopedically so that the side face of

three chip resistors 4 may become an equal location. Furthermore, as the top-face application-of-pressure section 16 rotates from the condition which shows in drawing 2 and it is shown in drawing 3 R> 3 (e), three accumulated chip resistors 4 are pressurized from a top face, and are heated at a heater 17.

[0027] The condition that array spacing of three chip resistors 4 becomes irregular with the surface tension of adhesives 13 by application of pressure by the top-face application-of-pressure section 16 as shown in drawing 4 (a) is canceled, and as shown in drawing 4 (b), three chip resistors 4 can form in the compound electronic parts 1 which fixed at equal spacing. therefore, the junction location of the circuit pattern formed on the circuit board when the compound electronic parts 1 formed in this way were mounted in the circuit board -- each chip resistor 4 -- each polar-zone 4a comes to be located in accuracy.

[0028] Moreover, when the adhesives 13 thermosetting in the condition of having been regulated by the predetermined measurement by each side-face application-of-pressure sections 15a and 15b and the top-face application-of-pressure section 16 of a fixed side and a movable side are hardened and regulation is solved by heating of a heater 17, the compound electronic parts 1 of a predetermined dimension are completed. Moreover, by using thermosetting adhesive, in the condition of being in the adhesives imprint section 14, it does not harden but will become effective in the maintenance of adhesives 13.

[0029] Moreover, as shown in drawing 2, it can prevent that the smoothness of a component side is spoiled by the dimension error of a chip resistor 4 by attaching an elastic body 25 in the application-of-pressure side of movable side side application-of-pressure section 15b. That is, in small electronic parts, such as a chip resistor 4, it is common that a crosswise dimension error is permitted to $\pm 0.05\text{mm}$, and since a width method will be decided with the chip resistor 4 with a large dimension even if it pressurizes by fixed side side application-of-pressure section 15a and movable side side application-of-pressure section 15b as shown in drawing 5 (a) when the chip resistor 4 with a crosswise large dimension is intermingled, a component side does not become flat-tapped. Then, if the elastic body 25 is attached in the application-of-pressure side of movable side side application-of-pressure section 15b, since the large chip resistor 4 of a dimension error will compress an elastic body 25 to be shown in drawing 5 (b) When the side face of each chip resistor becomes flat-tapped in the application-of-pressure side side of fixed side side application-of-pressure section 15a and it fixes with adhesives 13, As shown in drawing 5 (c), if this component side 26 is turned and mounted in the circuit board, each chip resistor 4 can form in the compound electronic parts 1 which contact a circuit pattern by making into a component side 26 the side face which became flat-tapped.

[0030] Next, the 2nd operation gestalt from which the method of application of adhesives differs is explained. In addition, the same sign is given to the component which is common in a previous configuration, and the explanation is omitted.

[0031] In drawing 6, it is constituted so that the dispensing head 18 which applies adhesives with the adsorption nozzle 12 can move onto 1 shaft robot's 22 orbit 27. When the rise-and-fall driving gear 28 carries out transit migration of said orbit 27 top, said dispensing head 18 is horizontally movable, while it is carried in the rise-and-fall driving gear 28 and enables rise-and-fall migration.

[0032] As are shown in drawing 7 (a), and adsorption maintenance of the chip resistor 4 is carried out from a parts feeder 11 by the adsorption nozzle 12 which moved to the supply location and it is shown in drawing 7 (b), it moves to an assembly location and a chip resistor 4 is laid on the assembly stage 10. As the dispensing head 18 moves to an assembly location to compensate for the adsorption nozzle 12 moving to a supply location and it is shown in drawing 7 (c), it descends on a chip resistor 4 and adhesives 13 are applied. Since the adsorption nozzle 12 which moved to the supply location in the meantime is carrying out adsorption maintenance of the following chip resistor 4 from the parts feeder 11, to compensate for the dispensing head 18 going up and moving to an evacuation location, it moves to an assembly location, and as shown in drawing 7 (d), the following chip resistor 4 is accumulated on the chip resistor 4 with which adhesives 13 were applied.

[0033] As shown in drawing 7 (e), movable side side application-of-pressure section 15b will move, a side face will be pressurized between fixed side side application-of-pressure section 15a, and if this actuation is repeated and the chip resistor 4 of a required number is accumulated on the assembly stage 10, as shown in drawing 7 (f), when the top-face application-of-pressure section 16 pressurizes from a top face, the chip resistor 4 of the accumulated required number will be orthopedically operated by the predetermined dimension. Moreover, it is heated at a heater 17 in the meantime, and when the thermosetting adhesives 13 are hardened and movable side side application-of-pressure section 15b and the top-face application-of-pressure section 16 return to the original location, the chip resistor 4 of a required number is unified as compound electronic parts 1.

[0034] In the configuration of two examples mentioned above, in order to raise productivity more, as shown

in drawing 8 , it can constitute the assembly stage 33 which accumulates and makes a chip resistor 4 two or more trains, and manufactures simultaneously two or more compound electronic parts 1. On this assembly stage 33, while making area of stage 33a large, according to this, the width of face of fixed side side application-of-pressure section 35a and movable side side application-of-pressure section 35b, the top-face application-of-pressure section 36, and a heater 37 is expanded. After accumulating a chip resistor 4 on two or more trains on stage 33a one after another from a parts feeder 11 by the adsorption nozzle 12, hardening and plastic surgery of adhesives 13 are performed simultaneously. Since hardening of adhesives 13 which this configuration takes a duration most is made by two or more trains coincidence, manufacture of the compound electronic parts 1 can be performed efficiently.

[0035]

[Effect of the Invention] Since small electronic parts are accumulated in respect of the large area and it pastes up according to this invention as the above explanation, spreading of adhesives is easy and it can constitute to equipment without interference with a spreading means and an assembly means. Moreover, also when there is dispersion in the dimension of electronic parts, a component side can be finished flat-tapped and can manufacture compound electronic parts without poor mounting.

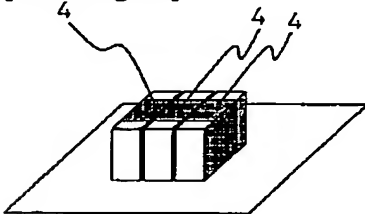
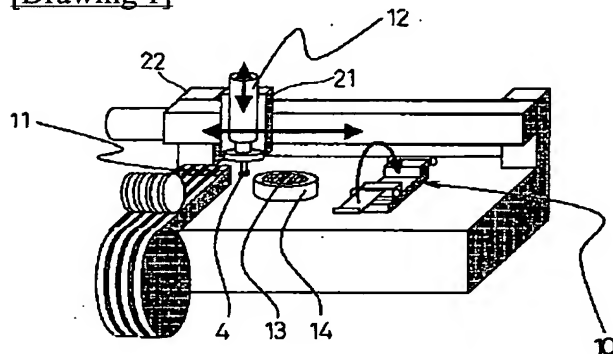
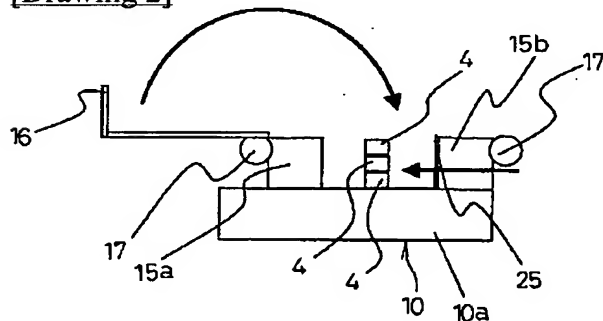
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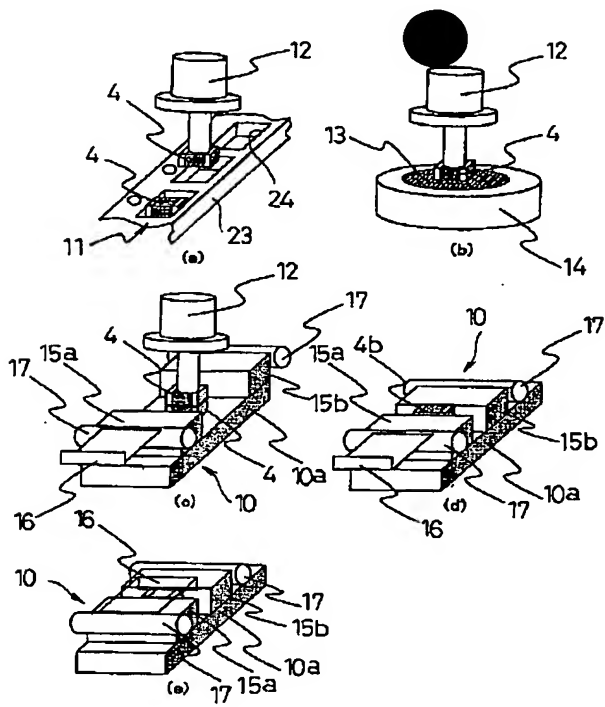
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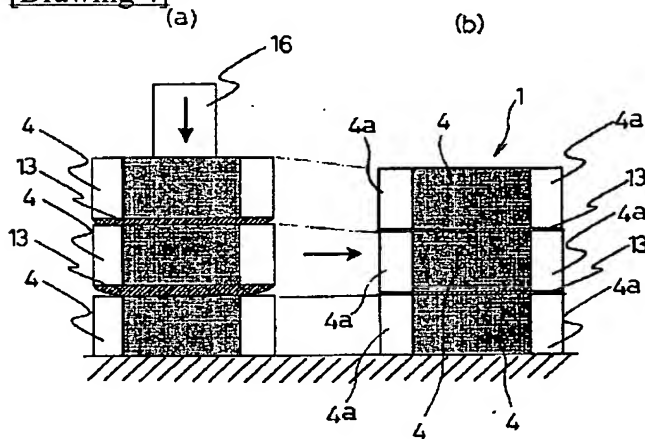
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DRAWINGS

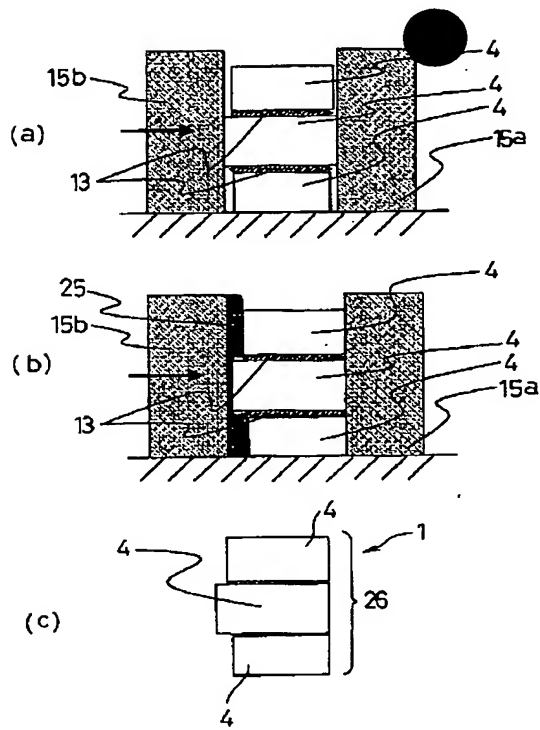
[Drawing 10][Drawing 11][Drawing 12][Drawing 13]



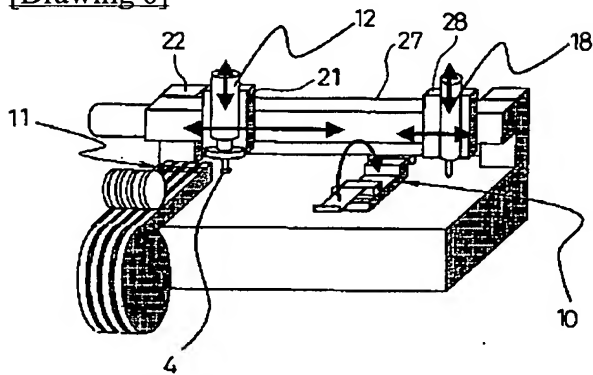
[Drawing 4]



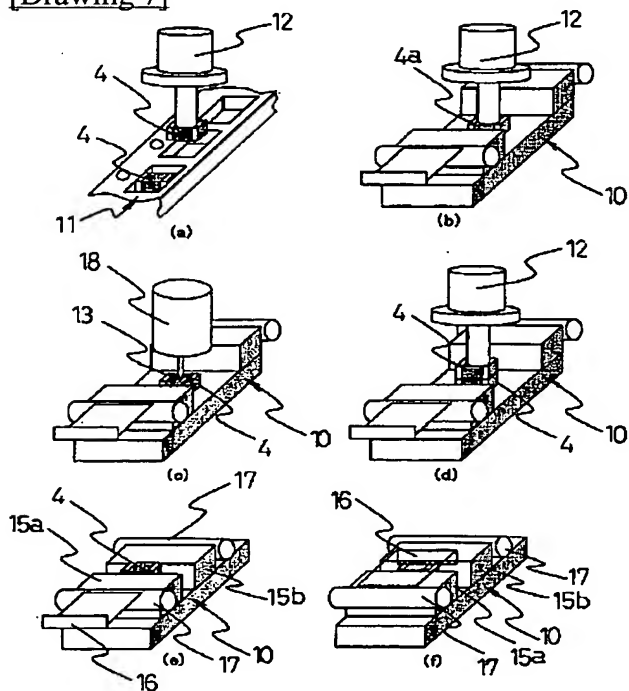
[Drawing 5]



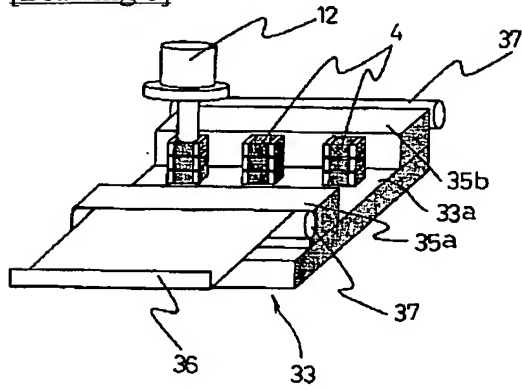
[Drawing 6]



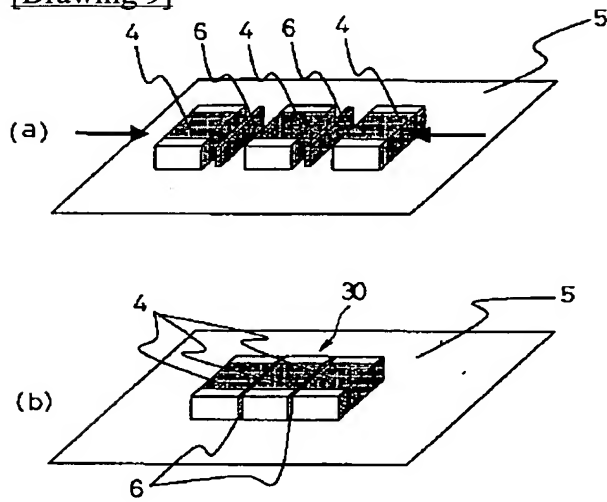
[Drawing 7]



[Drawing 8]



[Drawing 9]



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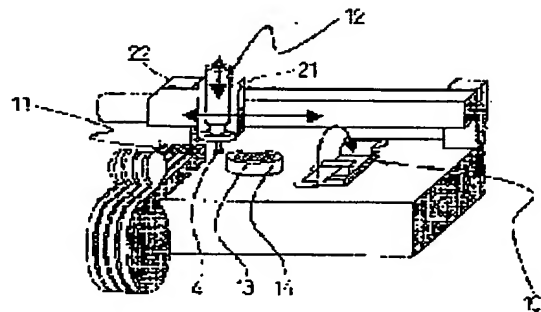
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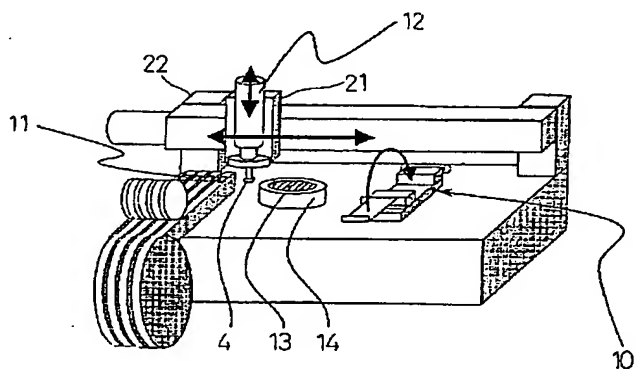
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(54) 【発明の名称】 複合電子部品の製造方法及びその装置

(57) 【要約】

【課題】 複数の電子部品を一体に固着して複合電子部品に形成する複合電子部品の製造方法及びその装置を提供する。

【解決手段】 吸着ノズル12によりパーツフィーダ11からチップ抵抗器(電子部品)4を保持して組立ステージ10上に移載して所要数を積み重ねる。重ねた所要位置のチップ抵抗器4には接着剤転写部14で熱硬化性接着剤を転写する。組立ステージ10において積み重ねた側面及び上面から加圧すると共に加熱することにより、所要数のチップ抵抗器4は整形及び固着されて複合電子部品に形成される。



【特許請求の範囲】

【請求項 1】 部品供給部から供給される電子部品を部品保持手段により保持して組立部に運ぶ動作を所要数の電子部品について繰り返すことにより前記組立部に所要数の電子部品を積み重ね、組立部において所要数の電子部品の間を接着すると共に整形して複合電子部品を製造することを特徴とする複合電子部品の製造方法。

【請求項 2】 所要数の電子部品の間の接着は、部品供給部から組立部に至る途上で電子部品の下面に転写された接着剤による請求項 1 に記載の複合電子部品の製造方法。

【請求項 3】 所要数の電子部品の間の接着は、組立部に置かれた電子部品の上面に塗布された接着剤による請求項 1 に記載の複合電子部品の製造方法。

【請求項 4】 積み重ねた電子部品の上面及び側面から加圧して整形する請求項 1 に記載の複合電子部品の製造方法。

【請求項 5】 所要数の電子部品の間に熱硬化性接着剤を配し、整形時に加熱して硬化させる請求項 1～4 いずれか一項に記載の複合電子部品の製造方法。

【請求項 6】 組立部に複数列に所要数の電子部品を積み重ねて同時に接着すると共に整形する請求項 1～5 いずれか一項に記載の複合電子部品の製造方法。

【請求項 7】 電子部品を供給位置に供給する部品供給手段と、電子部品を保持する部品保持手段と、この部品保持手段を供給位置と組立位置との間に移動させて電子部品を供給位置から組立位置に移載して組立位置に所要数の電子部品を積み重ねる移載手段と、電子部品に接着剤を塗布する接着剤塗布手段と、組立位置に積み重ねられた所要数の電子部品の上面及び側面から加圧して接着及び整形して所要数の電子部品を一体化する組立手段とを備えてなることを特徴とする複合電子部品の製造装置。

【請求項 8】 接着剤塗布手段は、供給位置から組立位置に移載される途上の電子部品の下面に接着剤を転写する請求項 7 に記載の複合電子部品の製造装置。

【請求項 9】 接着剤塗布手段は、組立位置に移載された電子部品の上面に接着剤を塗布する請求項 7 に記載の複合電子部品の製造装置。

【請求項 10】 組立手段は、整形時に加熱して熱硬化性接着剤を硬化させる加熱手段を備えてなる請求項 7～9 いずれか一項に記載の複合電子部品の製造装置。

【請求項 11】 組立手段は、積み重ねられた電子部品の側面を対向方向から加圧する一方の加圧面に弾性体が設けられてなる請求項 7 に記載の複合電子部品の製造装置。

【請求項 12】 組立手段は、組立位置に複数列に積み重ねられた所要数の電子部品に対して同時に加圧する幅の加圧面を備えてなる請求項 7、10、11 いずれか一項に記載の複合電子部品の製造装置。

【発明の詳細な説明】**【0001】**

【発明の属する技術分野】本発明は、複数の電子部品を固着して一体化する複合電子部品の製造方法及びその装置に関するものである。

【0002】

【従来の技術】抵抗器やコンデンサなど複数の電子部品を一体化して複合電子部品に形成すると、回路基板に実装するとき複数の電子部品を 1 つの複合電子部品として扱うことができるので、回路基板への実装点数の削減することができると同時に実装スペースを削減することができる。また、コンデンサとコイルとを一体化してフィルタの機能を有する複合電子部品に構成するなどの機能部品を作ることにも有効である。

【0003】図 9 は、従来の複合電子部品の製造方法を示すもので、複数（ここでは 3 個）のチップ抵抗器を一体化して複合電子部品を製造する例を示している。図 9（a）に示すように、3 個のチップ抵抗器 4 を平板面 5 上に間隔を置いて並べ、チップ抵抗器 4 の間に粘着シート 6 を配して両側から押し、図 9（b）に示すように、3 個のチップ抵抗器 4 を粘着シート 6 で固着した複合電子部品 30 に形成する。

【0004】複数のチップ抵抗器 4 を一体に固着する手段として、上記粘着シート 6 の他に、接着剤をチップ抵抗器 4 の側面に塗布する製造方法や、密着させて並べた複数のチップ抵抗器 4 の上面に粘着剤を塗着したシートを貼着する製造方法なども採用されている。

【0005】

【発明が解決しようとする課題】しかしながら、チップ部品などの電子部品は小型化が著しく、現実にはチップ抵抗器で 1.0×0.5×0.35mm のものがあり、更に小型化が進行している。このような極小の電子部品を用いて複合電子部品を形成するとき、接着剤の塗布するための装置や粘着シートを貼着するための装置を組立位置に配するには、組立のための装置との干渉が避けられず、小型の複合電子部品の形成が困難であった。また、粘着剤を塗着したシートを貼着する製造方法では、電極間の絶縁を確保することが困難となる問題点があった。

【0006】また、電子部品を組立位置に運ぶために電子部品は吸着ノズルによって吸着保持されるが、小型の電子部品では吸着面積が大きく取れる広い面で吸着保持され、平板面に載置するときの座りの良さから、図 9 に示したように直方体の広い平面部分が上下に位置するように平板面上に載置される。従って、複合電子部品に形成されたとき、図 9（b）に示すように、実装面（底面）の面積が大きくなる。図 10 に示すように、電子部品の狭い平面部分が上下に位置するようにして複合電子部品に形成すると、実装面積を小さくすることができるが、個々の電子部品を平板面に載置したときの座りが悪

く、安定して複数個の電子部品を並べることができない。

【0007】本発明が目的とするところは、複数の小型電子部品を実装面積が小さくなるように一体化して複合電子部品に形成する製造方法及びその装置を提供することにある。

【0008】

【課題を解決するための手段】上記目的を達成するための本願の第1発明に係る複合電子部品の製造方法は、部品供給部から供給される電子部品を部品保持手段により保持して組立部に運ぶ動作を所要数の電子部品について繰り返すことにより前記組立部に所要数の電子部品を積み重ね、組立部において所要数の電子部品の間を接着すると共に整形して複合電子部品を製造することを特徴とするものである。

【0009】上記製造方法によれば、部品保持手段により部品供給部から組立部に電子部品を移載して、組立部に複数の電子部品を積み重ねるとき、電子部品の広い平面部分で積み重ねると安定した状態が得られ、これを接着及び整形すると、電子部品の狭い平面部分を実装面として実装面積の小さい複合電子部品に形成することができる。

【0010】上記製造方法において、所要数の電子部品の間の接着は、部品供給部から組立部に至る途上で電子部品の下面に接着剤を転写する方法、あるいは組立部に置かれた電子部品の上面に接着剤を塗布する方法によって実現することができる。

【0011】また、積み重ねた電子部品の上面及び側面から加圧して整形することにより、接着剤層の厚さを一定に整えて接着状態を安定させ、位置ずれなどを整えて所定寸法に仕上げることができる。

【0012】また、所要数の電子部品の間に熱硬化性接着剤を配し、整形時に加熱して硬化させると、整形と同時に接着を完了させることができ、熱硬化性接着剤は常温では硬化しないため転写もしくは塗布する段階では変化せず、接着剤としての維持管理が容易となる。

【0013】また、組立部に複数列に所要数の電子部品を積み重ねて同時に接着すると共に整形することができる。

【0014】また、本願の第2発明に係る複合電子部品の製造装置は、電子部品を供給位置に供給する部品供給手段と、電子部品を保持する部品保持手段と、この部品保持手段を供給位置と組立位置との間に移動させて電子部品を供給位置から組立位置に移載して組立位置に所要数の電子部品を積み重ねる移載手段と、電子部品に接着剤を塗布する接着剤塗布手段と、組立位置に積み重ねられた所要数の電子部品の上面及び側面から加圧して接着及び整形して所要数の電子部品を一体化する組立手段とを備えてなることを特徴とするものである。

【0015】上記製造装置によれば、移載手段により部品保持手段を供給位置と組立位置との間に移動させて部品供給部から組立部に電子部品を移載して、組立部に複数の電子部品を積み重ねる。小型の電子部品では広い面で部品保持手段に吸着保持される必要があり、電子部品の広い平面部分で積み重ねられることになり、これを接着及び整形すると、電子部品の狭い平面部分を実装面として実装面積の小さい複合電子部品に形成することができる。

【0016】上記製造装置において、接着剤塗布手段は、供給位置から組立位置に移載される途上の電子部品の下面に接着剤を転写する構成、あるいは組立位置に移載された電子部品の上面に接着剤を塗布する構成により、必要な電子部品の積み重ね面に選択的に接着剤を塗着させることができる。

【0017】また、組立手段は、整形時に加熱して熱硬化性接着剤を硬化させる加熱手段を備えて構成することにより、整形時に接着剤の硬化を行なって効率よく複合電子部品を製造することができる。

【0018】また、組立手段は、積み重ねられた電子部品の側面を対向方向から加圧する一方の加圧面に弾性体を設けて構成することにより、電子部品の寸法のばらつきを弾性体で吸収して、実装面は平面になるように整形することができる。

【0019】また、組立手段は、組立位置に複数列に積み重ねられた所要数の電子部品に対して同時に加圧する幅の加圧面を備えて構成することができ、複数個の複合電子部品を同時に整形して完成させることができる。

【0020】

【発明の実施の形態】以下、添付図面を参照して本発明の実施形態について説明し、本発明の理解に供する。尚、以下に示す実施形態は本発明を具体化した一例であって、本発明の技術的範囲を限定するものではない。

【0021】本実施形態は、複数のチップ抵抗器を一体に固着して複合電子部品に製造する例を示すもので、図1に示すように、パーツフィーダ（部品供給手段）11から供給されるチップ抵抗器（電子部品）4を吸着ノズル（部品保持手段）12により保持して組立ステージ（組立手段）10に運ぶ動作を所要数のチップ抵抗器4について繰り返すことにより前記組立ステージ10に所要数のチップ抵抗器4を積み重ね、組立ステージ10において所要数のチップ抵抗器4の間を接着すると共に整形して複合電子部品を製造する。

【0022】前記吸着ノズル12は昇降駆動装置21に搭載され、この昇降駆動装置21は1軸ロボット22により図示矢印方向に自在移動する。従って、吸着ノズル12は前記パーツフィーダ11のある供給位置から前記組立ステージ10のある組立位置の間を自在移動し、その間で自在に昇降動作することができる。また、パーツフィーダ11は、チップ抵抗器4を収納したテープを供

給位置に繰り出して供給位置にチップ抵抗器4を逐一供給する。また、組立ステージ10は、図2に示すように、固定側面加圧部15a、可動側面加圧部15b、上面加圧部16、ヒータ17を備え、ステージ10a上に積み重ねられた複数のチップ抵抗器4を複合電子部品に形成する。また、吸着ノズル12がパーツフィーダ11から組立ステージ10に移動する途上に接着剤転写部14が配設されている。

【0023】上記構成になる製造装置による複合電子部品の製造手順について、図1～図3を参照して説明する。

【0024】図3(a)において、パーツフィーダ11はテープ23に等間隔に設けられた凹部24内にチップ抵抗器4を収容し、このテープ23を供給位置に凹部24の形成間隔で繰り出す。テープ23は抵抗値等の品種毎にリールに巻回してあり、図1に示すように、複数のテープ23が供給位置に並列に配置される。1軸ロボット22により吸着ノズル12を供給位置に移動させ、昇降駆動装置21により下降させてノズル先端にチップ抵抗器4を吸着保持させる。吸着ノズル12を上昇させ、組立ステージ10上に移動させ、下降させることによりステージ10a上に積み重ねる最下位置のチップ抵抗器4が載置される。吸着ノズル12の真空負圧を排気により切り換え、上昇することによりチップ抵抗器4から離れた吸着ノズル12は再び供給位置に移動して次のチップ抵抗器4を吸着保持する。

【0025】本実施形態においては、3個のチップ抵抗器4を一体に固着して複合電子部品に形成するので、積み重ねる2段目になるチップ抵抗器4を吸着保持した吸着ノズル12は供給位置から移動して接着剤転写部14上に停止させ、下降させることにより、図3(b)に示すように、チップ抵抗器4の底面が接着剤転写部14上に供給された接着剤13に付着して底面に接着剤13が転写される。尚、ここでは接着剤13として熱硬化性接着剤を用いている。この底面に接着剤13が転写されたチップ抵抗器4は吸着ノズル12の移動により組立ステージ10上にある1段目のチップ抵抗器4上に載置されて2段の積み重ねとなる。続いて3段目のチップ抵抗器4も同様にして接着剤13が転写されて組立位置に運ばれ、図3(c)に示すように、3個のチップ抵抗器4を3段に積み重ねた状態にする。

【0026】組立ステージ10は、3個のチップ抵抗器4がステージ10a上に積み重ねられると、図3(d)に示すように、可動側面加圧部15bが固定側面加圧部15a側に移動し、積み重ねられた3個のチップ抵抗器4を両側面加圧部15a、15bで挟み込み、3個のチップ抵抗器4の側面が均等位置になるように整形する。更に、上面加圧部16が図2に示す状態から回動し、図3(e)に示すように、積み重ねられた3個のチップ抵抗器4を上面から加圧し、ヒータ17により加熱する。

【0027】上面加圧部16による加圧により、図4(a)に示すように、接着剤13の表面張力で3個のチップ抵抗器4の配列間隔が不揃いになる状態が解消され、図4(b)に示すように、3個のチップ抵抗器4が均等な間隔で固着された複合電子部品1に形成することができる。従って、このように形成された複合電子部品1を回路基板に実装したとき、回路基板上に形成された回路パターンとの接合位置に各チップ抵抗器4それぞれの電極部4aが正確に位置するようになる。

【0028】また、ヒータ17の加熱により、固定側及び可動側の各側面加圧部15a、15bと上面加圧部16とにより所定の仕上がり寸法に規制された状態で熱硬化性の接着剤13は硬化し、規制が解かれたとき所定寸法の複合電子部品1に完成される。また、熱硬化性接着剤を用いることにより、接着剤転写部14にある状態では硬化せず、接着剤13の維持管理に有効なものとなる。

【0029】また、図2に示すように、可動側面加圧部15bの加圧面に弾性体25を取り付けることにより、チップ抵抗器4の寸法誤差により実装面の平面性が損なわれることが防止できる。即ち、チップ抵抗器4などの小型電子部品では幅方向の寸法誤差が±0.05mmまで許容されるのが一般的であり、幅方向の寸法が大きいチップ抵抗器4が混在している場合、図5(a)に示すように、固定側面加圧部15aと可動側面加圧部15bとで加圧しても、寸法の大きいチップ抵抗器4により幅寸法が決められてしまうため、実装面が面一とはならない。そこで、可動側面加圧部15bの加圧面に弾性体25を取り付けておくと、図5(b)に示すように、寸法誤差の大きいチップ抵抗器4は弾性体25を圧縮するので、固定側面加圧部15aの加圧面側では各チップ抵抗器の側面は面一となり、接着剤13で固着されたとき、図5(c)に示すように、面一となった側面を実装面26として、この実装面26を回路基板に向けて実装すると各チップ抵抗器4が回路パターンに当接する複合電子部品1に形成することができる。

【0030】次に、接着剤の塗布方法が異なる第2の実施形態について説明する。尚、先の構成と共通する構成要素には同一の符号を付し、その説明は省略する。

【0031】図6において、1軸ロボット22の軌道27上には、吸着ノズル12と共に接着剤を塗布するディスペンスヘッド18が移動できるように構成されている。前記ディスペンスヘッド18は昇降駆動装置28に搭載されて昇降移動を可能にすると共に、昇降駆動装置28が前記軌道27上を走行移動することによって水平方向にも移動できる。

【0032】図7(a)に示すように、供給位置に移動した吸着ノズル12によりパーツフィーダ11からチップ抵抗器4を吸着保持し、図7(b)に示すように、組立位置に移動して組立ステージ10上にチップ抵抗器4

が載置される。吸着ノズル 12 が供給位置に移動するのに合わせてディスペンスヘッド 18 が組立位置に移動し、図 7 (c) に示すように、チップ抵抗器 4 上に下降して接着剤 13 を塗布する。この間に供給位置に移動した吸着ノズル 12 はパーツフィーダ 11 から次のチップ抵抗器 4 を吸着保持しているので、ディスペンスヘッド 18 が上昇して退避位置に移動するのに合わせて組立位置に移動し、図 7 (d) に示すように、接着剤 13 が塗布されたチップ抵抗器 4 上に次のチップ抵抗器 4 を積み重ねる。

【0033】この動作を繰り返して組立ステージ 10 上に所要数のチップ抵抗器 4 が積み重ねられると、図 7 (e) に示すように、可動側面加圧部 15 b が移動して固定側面加圧部 15 a との間で側面が加圧され、図 7 (f) に示すように、上面加圧部 16 が上面から加圧することにより、積み重ねられた所要数のチップ抵抗器 4 は所定寸法に整形される。また、この間にヒータ 17 により加熱されて熱硬化性の接着剤 13 は硬化し、可動側面加圧部 15 b 及び上面加圧部 16 が元の位置に復帰したとき、所要数のチップ抵抗器 4 は複合電子部品 1 として一体化される。

【0034】上述した 2 例の構成において、より生産性を高めるために、図 8 に示すように、複数列にチップ抵抗器 4 を積み重ねて複数の複合電子部品 1 を同時に製造する組立ステージ 33 に構成することができる。この組立ステージ 33 では、ステージ 33 a の面積を広くすると共に、これに合わせて固定側面加圧部 35 a 及び可動側面加圧部 35 b、上面加圧部 36、ヒータ 37 の幅を広げている。吸着ノズル 12 によりパーツフィーダ 11 から次々とステージ 33 a 上にチップ抵抗器 4 を複数列に積み重ねた後、接着剤 13 の硬化及び整形が同時に行なわれる。この構成では最も所要時間を要する接着剤 13 の硬化が複数列同時になされるので、効率よく複合電子部品 1 の製造ができる。

【0035】

【発明の効果】以上の説明の通り本発明によれば、小型の電子部品をその広い面積面で積み重ねて接着するので、接着剤の塗布が容易で、塗布手段と組立手段との干

渉のない装置に構成することができる。また、電子部品の寸法のばらつきがあるときにも実装面は面一に仕上げることができ、実装不良のない複合電子部品を製造することができる。

【図面の簡単な説明】

【図 1】第 1 の実施形態に係る複合電子部品の製造装置の構成を示す斜視図。

【図 2】組立ステージの構成を示す側面図。

【図 3】複合電子部品に組み立てる工程を (a) ~ (e) の順に示す斜視図。

【図 4】上面加圧部による加圧の作用を説明する側面図。

【図 5】電子部品の寸法誤差による問題点 (a) とその解決構成 (b) 及び完成状態 (c) を示す側面図。

【図 6】第 2 の実施形態に係る複合電子部品の製造装置の構成を示す斜視図。

【図 7】複合電子部品に組み立てる工程を (a) ~ (f) の順に示す斜視図。

【図 8】生産性を向上させるための組立ステージの構成を示す斜視図。

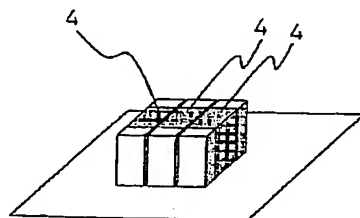
【図 9】従来の製造方法の手順を (a) (b) の順に示す斜視図。

【図 10】実装面積を小さくした実装状態を示す斜視図。

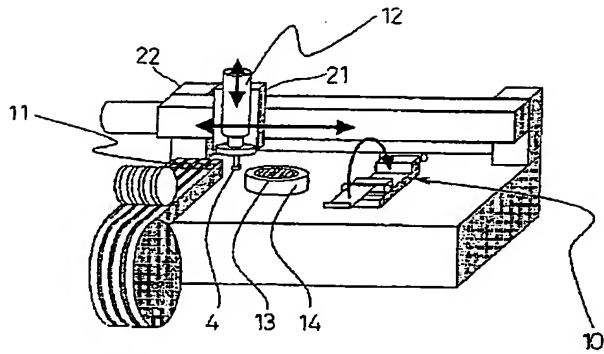
【符号の説明】

- 1 複合電子部品
- 4 チップ抵抗器 (電子部品)
- 10 組立ステージ (組立手段)
- 11 パーツフィーダ (部品供給手段)
- 12 吸着ノズル (部品保持手段)
- 14 接着剤転写部
- 15 a、35 a 固定側面加圧部
- 15 b、35 b 可動側面加圧部
- 16、36 上面加圧部
- 17、37 ヒータ (加熱手段)
- 18、37 ディスペンスヘッド (接着剤塗布手段)
- 25 弾性体

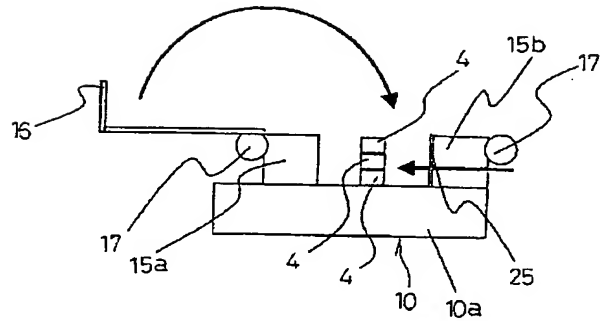
【図 10】



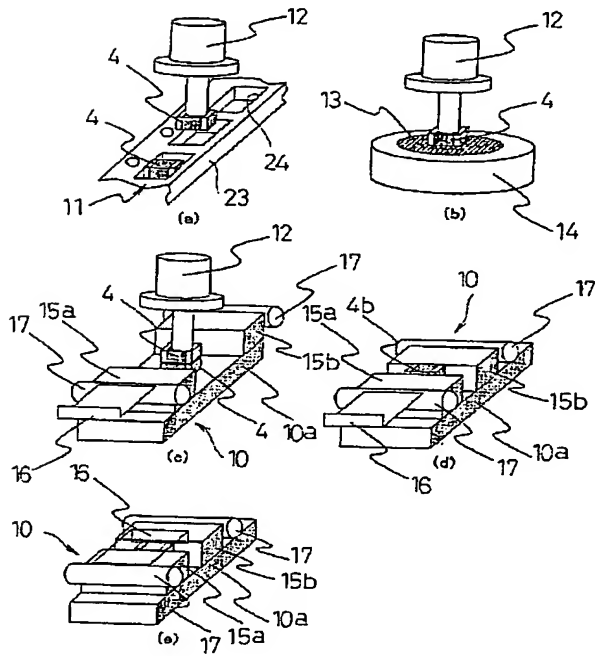
【図1】



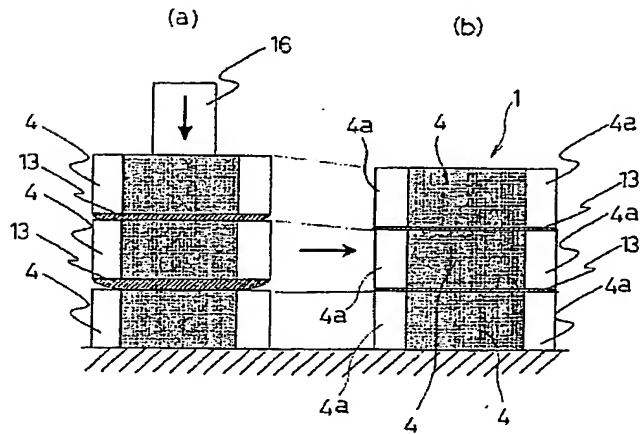
【図2】



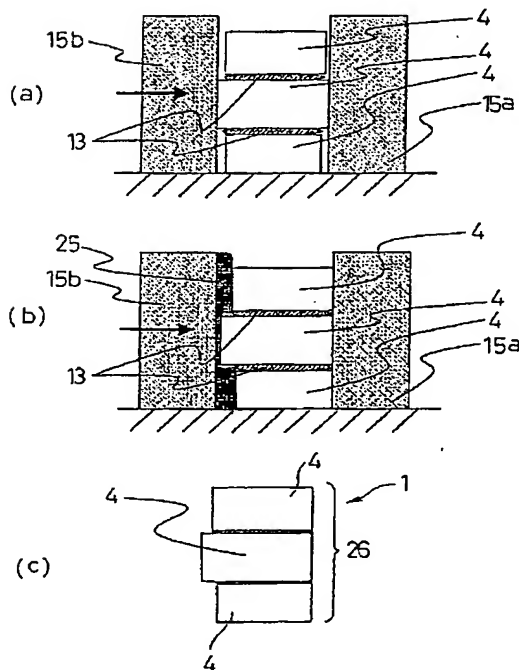
【図3】



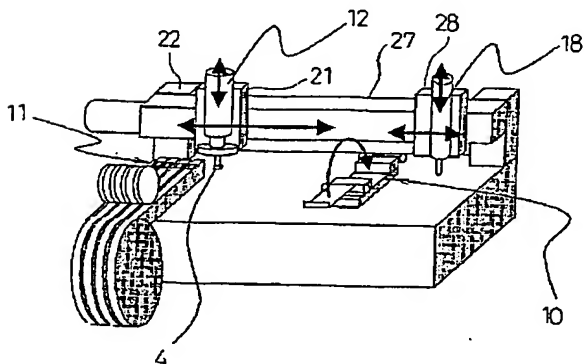
【図4】



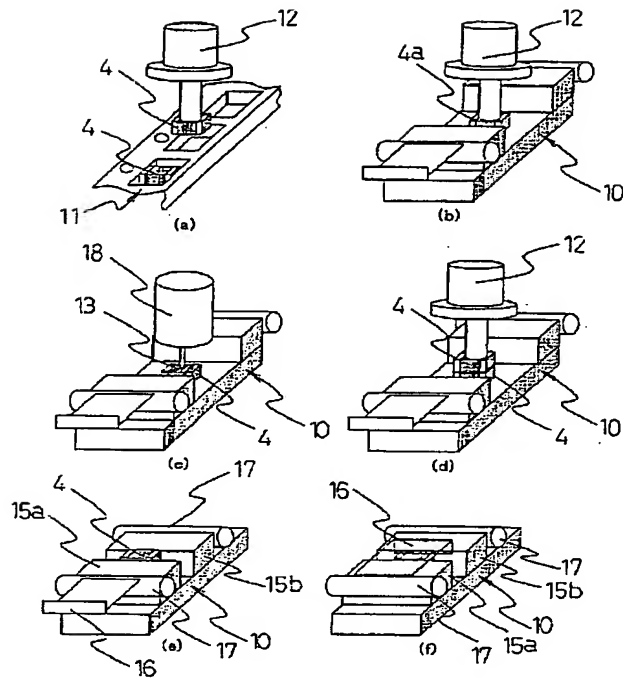
【図5】



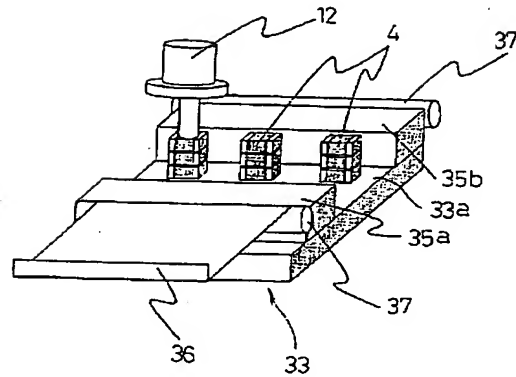
【図6】



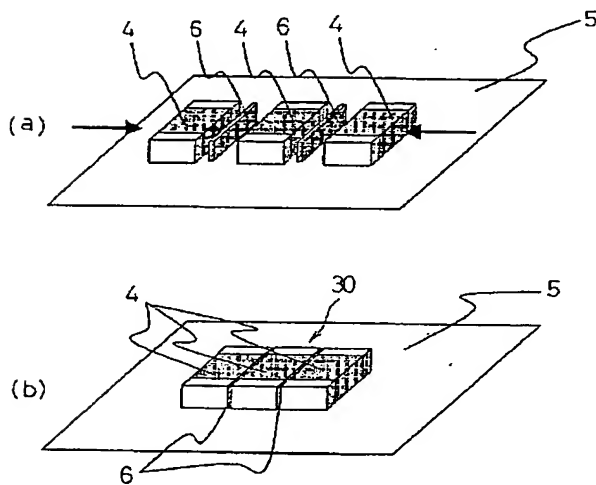
【図7】



【図8】



【図9】



フロントページの続き

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